BABY
X' GOLDEN 386
80386 MOTHER BOARD
USER'S MANUAL

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CHAPTER 1

INTRODUCTION

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INTRODUCTION

The 80386 CPU board is a high-performance system board that provides the primary elements for building advanced personal computers. The board is functionally and mechanically compatible with the system board of the IBM PC/AT. However, it contains an 80386 microprocessor, 32-bit memory access, and other features that give it more than treble the performance of an 8MHz IBM AT.

FEATURES

Major features of the 80386 board include:

* Intel 16MHz 80386 central processor and supporting circuits.

* Sockets for the Intel 80387/80287 math coprocessor.

* On board ROM BIOS compatible with the IBM AT BIOS will boot in PC-DOS or MS-DOS.

* RAM memory (Seventy Two 256Kx1/1Mx1 memory chips for a total of 2048K/8192K bytes of 32 bits interleaved memory on the system board).

* 8742 Keyboard controller interfaces for an AT compatible keyboard.

* Keylock interface provided.

* Real-time clock with battery backed up CMOS memory for system configuration data.

* Sixteen interrupt sources.

* Seven Direct Memory Access (DMA) channels.

* Expansion bus interface (two 8-bit slots exclusively for PC-compatible expansion boards and five 16-bit slots for both AT- and PC-compatible board).

* One expansion slot for high speed 32-bit RAM expansion boards to install memory up to 16MB.(this slot can also be used for PC-compatible expansion boards).

* Speaker interface.

* 16MHz(20MHz)/ 20MHz(25MHz) soft/hard switch select.

HOW TO USE THIS MANUAL

This manual is written for the original equipment manufacturer (OEM) who plans to build computer systems based on the 80386 board. It describes the major features of the board, provides instructions for installing and configuring the 80386 board, and describes the system and setup requirements.

CHAPTER 2

FEATURES OF THE 80386 BOARD

CHAPTER 2

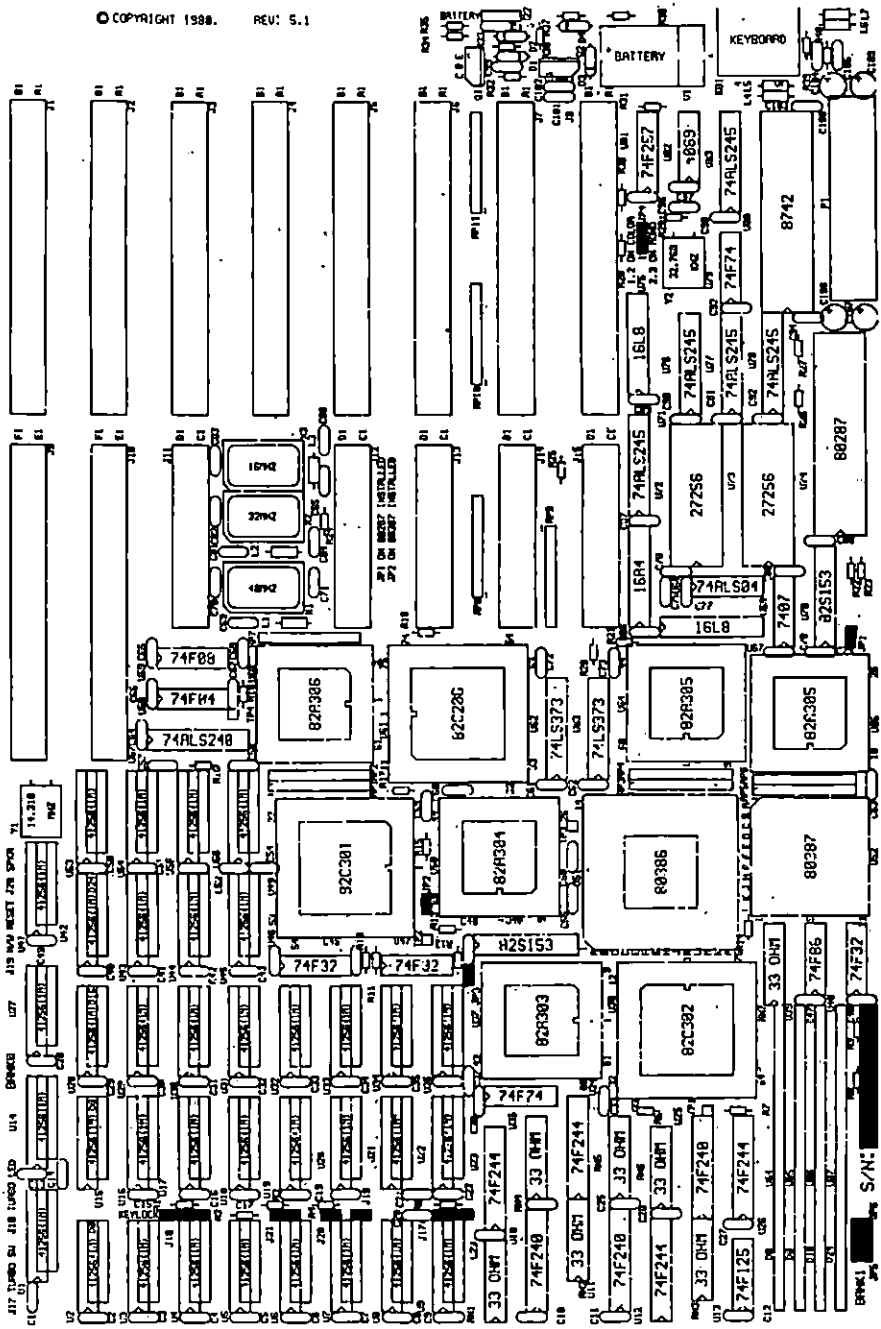
FEATURES OF THE 80386 BOARD

This chapter briefly describes each of the major features of the 80386 board. It covers the following features :

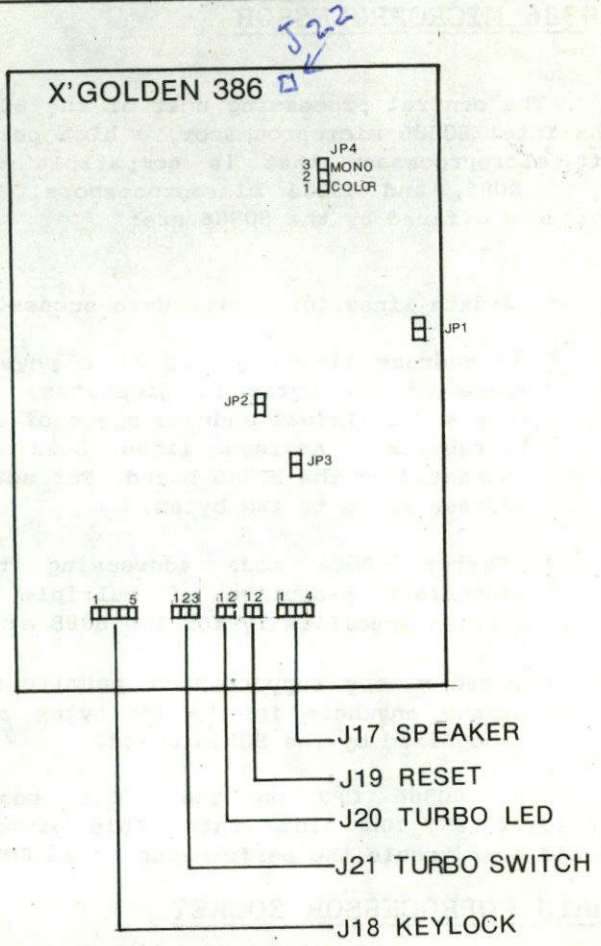
* 80386 processor
* Math coprocessor socket for 80387/80287
* Timers
* Memory
* Expansion slots
* I/O address map
* Interrupt controllers
* DMA controllers
* Real-time clock
* Keylock interface
* Speaker interface
* Power connectors
* Keyboard connector
* Turbo switch connector

Attached figure 2-1 shows the layout of the board with callouts identifying the jumper settings.

Fig 2-1A Layout for Baby 386 mainboard.



FOR 386B/386BE ONLY



JP2:NORMAL OPEN(OFF)
JP3:ON(SHORT)WITH 80387/80287
JP1:ON(SHORT)FOR 80387
OFF(OPEN)FOR 80287

80386 MICROPROCESSOR

The central processing unit of the 80386 board is the Intel 80386 microprocessor, a high performance 32-bit microprocessor that is compatible with Intel's 8088, 8086, and 80286 microprocessors. The advanced features offered by the 80386 are:

* 32 data lines for faster data access.

* 32 address lines, giving it a physical address space of 232 bytes (4 gigabytes) in protected mode and a virtual address space of 246 bytes (64 terrabytes). Address lines 0-23 and 31 are connected on the 80386 board. For actual physical address space to 16M bytes.

* Virtual 8086 mode addressing that permits concurrent execution of multiple applications written specifically for the 8088 or 8086.

* Paged memory support that permits memory to be mapped anywhere in the 16M-bytes address space recognized by the 80386 board.

The 80386 CPU on the 80386 board runs at 16(20)/20(25) MHz clock rate. This gives the system board over treble the performance of an 8MHz IBM AT.

MATH COPROCESSOR SOCKET

There are two different socket to install the mathematic coprocessors, they are:

(a). The 80287 math coprocessor socket is a 40-pin socket for an 80287 math coprocessor. The 80287 math coprocessor is clocked by the 8MHz CPU clock.

(b). The 80387 math coprocessor socket is a 68-pin socket for an 80387 math coprocessor. The 80387

math coprocessor is clocked by the 16(20)/ 20(25)MHz CPU clock.

TIMERS

An on-board 82C206 chip provides three programmable timers and all of them are clocked with the same timing frequency of 1.19MHz.

Table 2-1 System Timers

Timer	Function
0	Realtime clock. The output of this timer is tied to 8259 interrupt controller request 0 (IRQ0).
1	Refresh timer. The output of this timer is used to trigger memory refresh cycles. The BIOS loads this timer with a value of 012H before setting the RAM refresh period.
2	Speaker tone generator.

MEMORY

The 80386 board contains 2048K/8192K bytes of RAM for system access and 256Kx2 bytes of ROM that contains the BIOS. It also contains one 32-bit expansion slot for 32-bit extended memory boards.

2048KB/8192KB On Board RAM (Basic memory 640KB expansion memory 1024KB/7168KB, and Shadow RAM 384KB).

SHADOW RAM

As a default, if the CMOS contents are invalid, then the BIOS copies the ROM BIOS and the EGA BIOS onto the shadow RAM. However, if the user decides not to copy, the user should set the relevant information in the CMOS.

Thus with the CMOS set properly, ROM BIOS copying is decided by the CMOS contents. This setting is done through program which is available from CHIPS & TECHNOLOGY. AMI shall shortly provide a similar program to set the CMOS registers.

The system board contains 2048K/8192K bytes of 32-bit DRAM. Seventy two 256Kx1/1Mx1 DRAM chips are used for memory access, and eight 256Kx1/1Mx1 DRAM chips are used for the parity(with one parity bit for each byte of memory) checking.

The on board RAM is arranged into two 1024K/4096 bytes banks of memory. The interleaved memory arrangement allows relaxed DRAM precharge timing for continuous memory access. 16MHz systems use 120ns DRAMs, 20Mhz systems use 100ns DRAM, and 25MHz systems use 80ns DRAM.

Expanded memory should not be confused with extended memory. Extended memory is memory whose addresses begin at 1M bytes and continue up to 16M bytes linearly addressed by the CPU. Extended memory can be accessed only when the processor is in protected mode.

EXTENDED MEMORY BOARDS

One of the expansion slots on the 80386 board is a 32-bit slot that can contain extended memory boards. The 80386 board can recognize as much as 15M bytes of extended memory (starting at address 100000H and going to address OFFFFFFH). We provide 2M/8M Bytes memory boards for this slot. These boards use 256Kx1/1Mx1 DRAM chips with 120ns/100ns/80ns access time. There is a parity bit for each byte of data.

Because the 80386 board contains only one 32-bit expansion slot, only one 32-bit memory boards can be used. The memory on these boards are used as extended memory, with addresses begin at 2M/8M bytes (200000H/800000H). The first 2MB/8MB memory board must be plugged into slot J1/J9(slot 1).and J2/J10(slot 2).

SYSTEM ROM

The system board contains 256Kx2 bytes of ROM that comprise the system BIOS. This memory resides at the upper 256K bytes of address space in the first megabyte and is also mapped to the upper 256K bytes of the 16M-bytes space when the processor switches into protected mode. In protected mode, the BIOS can be accessed at either location.

The CPU accesses ROM 16 bits at a time. The system board will function correctly with ROM devices that have 200ns/150ns access time or shorter.

The BIOS supplied with the 80386 board is compatible with the BIOS in the IBM AT, as long as programs that access the BIOS use software interrupts without referring absolute memory locations. Programs that refer to absolute locations in the IBM AT BIOS will not function correctly when running on the 80386 board.

The 80386 ROM does not contain codes for the BASIC interpreter. Therefore, the IBM BASIC and BASIC interpreters will not run on this system board. Instead, users should acquire Microsoft's GW-BASIC interpreter in order to run BASIC programs.

EXPANSION SLOTS

The 62-pin PC/XT slots provide 8 bits data bus and 20 bits address bus. The AT slots provide 16 bits data bus and 24 bits address bus. The 80386 board contains both of these types of slots. In addition, it expands the bus further by supplying one slots with 32 bits data bus and 32 bits address bus.

It contains eight expansion slots of the following types:

* One 8-bit slot for PC-compatible expansion boards.

* Five 16-bit slots for AT-compatible and PC-compatible expansion boards.

* Two 32-bit slots for 2M/8M bytes 32-bit memory expansion boards or PC-compatible expansion boards.

All the 62-pin and 36-pin slot connectors are daisy chained together. That is, all 62-pin and 36-pin connectors provide the same signal connection.

Figure 2-1 shows the slot locations on the 80386 board. Table 2-2 lists the type of slot and the number of bits it addresses.

Table 2-2 Expansion Slot Types

Slot #	Data Bits	Address Bits	Type
1(J1/J9)	32	32	32-bit Memory/PC
2(J2/J10)	32	32	32-bit Memory/PC
3(J3/J11)	16	24	AT/PC
4(J4)	8	20	PC
5(J5/J12)	16	24	AT/PC
6(J6/J13)	16	24	AT/PC
7(J7/J14)	16	24	AT/PC
8(J8/J15)	16	24	AT/PC

EXTERNAL EXPANSION BUS CONNECTOR

Provides external bus connections for a system reqiring more than 8 slots.

8-BIT EXPANSION SLOTS

The IBM PC- and PC/XT-compatible 62- pin expansion slots, each can address up to 1M bytes and allow 8-bit data transfers.

Table 2-3 lists the pin assignment for the 8-bit slots.

Table 2-3 Pin Assignment for the 8-Bit Expansion Slot

I/O	SIGNAL	A PIN#	B PIN#	SIGNAL	I/O
-	GND	A 1	B 1	IOCHCK*	I
O	RSTDRV	A 2	B 2	7	I/O
-	+5V	A 3	B 3	6	I/O
I	IRQ9	A 4	B 4	5	I/O
-	-5V	A 5	B 5	4	I/O
I	DRQ2	A 6	B 6	3	I/O
-	-12V	A 7	B 7	2	I/O
I	SRDY*	A 8	B 8	D1	I/O
-	+12V	A 9	B 9	D0	I/O
-	GND	A10	B10	IOCHRDY	I
O	MEMW*	A11	B11	AEN	O
O	MEMW*	A12	B12	A19	I/O
O	IOWC*	A13	B13	A18	I/O
O	IOWC*	A14	B14	A17	I/O
O	DRCK3*	A15	B15	A16	I/O
I	DRQ3	A16	B16	A15	I/O
O	DRCK1*	A17	B17	A14	I/O
I	DRQ1	A18	B18	A13	I/O
I/O	MEMREF*	A19	B19	A12	I/O
O	SYSCLK	A20	B20	A11	I/O
I	IRQ7	A21	B21	A10	I/O
I	IRQ6	A22	B22	A 9	I/O
I	IRQ5	A23	B23	A 8	I/O
I	IRQ4	A24	B24	A 7	I/O
I	IRQ3	A25	B25	A 6	I/O
O	DACK2*	A26	B26	A 5	I/O
O	TC	A27	B27	A 4	I/O
O	BUSALE	A28	B28	A 3	I/O
-	+5V	A29	B29	A 2	I/O
O	OSC	A30	B30	A 1	I/O
-	GND	A31	B31	A 0	I/O

16-BIT EXPANSION SLOTS

J3/J11,J5/J12,J6/J13,J7/J14, and J8/J15 are extensions for the 62-pin PC-compatible slots that increase addressability to 16M bytes and enable 16-bit data transfers. These 36-pin slots extend in-line with the PC slots to form 16-bit slots that are compatible with those available on the PC AT. The 16-bit expansion slots operate at 8MHz bus cycles.

Table 2-4 Pin Assignment for the 16-Bit Expension slot

	REAR PANEL		
-MEM CS16 ------	D1	C1	------ SBHA
-I/O CS16 ------	D2	C2	------ LA23
IR10 ----------	D3	C3	------ LA22
IR11 ----------	D4	C4	------ LA21
IR12 ----------	D5	C5	------ LA20
IR15 ----------	D6	C6	------ LA19
IR14 ----------	D7	C7	------ LA18
-DACK0 ---------	D8	C8	------ LA17
DRQ0 ----------	D9	C9	------ -MEMR
-DACK5 ---------	D10	C10	------ -MEMW
DRQ5 ----------	D11	C11	------ SD08
-DACK6 ---------	D12	C12	------ SD09
DRQ6 ----------	D13	C13	------ SD10
-DACK7 ---------	D14	C14	------ SD11
DRQ7 ----------	D15	C15	------ SD12
+5V ----------	D16	C16	------ SD13
-MASTER --------	D17	C17	------ SD14
GND ----------	D18	C18	------ SD15
	MEMORY BUS PIN NUMBERING		

HIGH-SPEED 32-BIT RAM EXPANSION SLOTS

Slot J1/J9 and J2/J10 are 62+62 pin slots available for high-speed 32-bit RAM Expansion cards. The 2MB memory boards are plugged in these slots. These slots operate at 16MHz, which is the same speed with the system board RAM.

I/O ADDRESS MAP

The 80386 CPU communicates with other devices via I/O ports. Table 2-5 lists the I/O port addresses used in the 80386 board.

Table 2-5 I/O Address Map

Address (hexadecimal)	Device
00-1F	Direct Memory Access Controller #--(DMA) (82C206) (8-bit devices)
20-3F	Programmable interrupt Controller #1 (82C206)
40-5F	Timer/Counter (82C206)
60, 64	Keyboard Controller (8742)
61	On-board Testing Registers
70, 71	Clock/Calendar (82C206)
70, bit 7	NMI Mask
78	On-board Test Stimulus Register
80-9F	DMA Page Register (82C206)
A0-BF	Programmable Interrupt Controller #2 (82C206)
C0-DF	Direct Memory Access Controller #2--(DMA) (82C206) (16-bit devices)
F0	Clear the Busy signal of the Math Coprocessor
F1	Reset the Math Coprocessor
F8-FF	Math Coprocessor

INTERRUPT CONTROLLERS

The system board contains 82C206 Programmable Interrupt Controllers (PICs) that handles the hardware interrupts. Table 2-6 lists the interrupt lines, their priorities, and the devices to which the interrupt lines are connected. If an interrupt line is accessible by an expansion slot, the signal and the type of slot containing the signal will be shown on the table as well. The 8-bit slots are 62-pin PC-compatible slots. The 16-bit slots are AT-compatible that have 36-pin extension to the PC slot.

Table 2-6 Interrupt Lines

Priority	Source	Destination
NMI	Parity error	80386 NMI input
0	Timer Channel 0	Master PIC, Interrupt 0
1	Keyboard Controller	Master PIC, Interrupt 1
2	Slave PIC	Master PIC, Interrupt 2
3	Clock/Calendar	Slave PIC, interrupt 0
4	8-bit slot, IRQ9	Slave PIC, interrupt 1
5	16-bit slot, IRQ10	Slave PIC, interrupt 2
6	16-bit slot, IRQ11	Slave PIC, interrupt 3
7	16-bit slot, IRQ12	Slave PIC, interrupt 4
8	Math coprocessor Busy signal (NPXBSY *)	Slave PIC, interrupt 5
9	16-bit slot, IRQ14	Slave PIC, interrupt 6
10	16-bit slot, IRQ15	Slave PIC, interrupt 7
11	8-bit slot, IRQ3, Serial port	Master PIC, Interrupt 3
12	8-bit slot, IRQ4, Serial port	Master PIC, Interrupt 4
13	8-bit slot, IRQ5, Printer port	Master PIC, Interrupt 5
14	8-bit slot, IRQ6, Flexible disk drive	Master PIC, Interrupt 6
15	8-bit slot, IRQ7, Printer port	Master PIC, Interrupt 7

DMA CONTROLLERS

The system board contains 82C206 DMA (direct memory access) controllers for byte and word DMA. These controllers operate at 4MHz (the CPU clock divided by four), yielding a DMA clock cycle of 250ns. All DMA transfer cycles take 1250ns(approximately 5 DMA clocks). In addition, with a 16MHz CPU clock, 375ns are spent for acquiring control and 500ns for relinquishing control of the expansion bus.

Table 2-7 lists the DMA channels and the corresponding signals on the PC and AT expansion slots where these channels can be accessed.

Table 2-7 DMA Channels

DMA Channel Number		
Slave DMA Controller (Byte Transfer)	Master DMA Controller (Word Transfer)	Device
0		16-bit slot, DRQ0
1		8-bit slot, DRQ1
2		8-bit slot, DRQ2
3		8-bit slot, DRQ3
	4	Slave DMA Controller input into Master
	5	16-bit slot, DRQ5
	6	16-bit slot, DRQ6
	7	16-bit slot, DRQ7

REAL-TIME CLOCK

The system board contains an 80C206 real-time clock component that maintains date and time information in addition to storing configuration information about the computer system.

Because the real-time clock uses CMOS technology, it consumes very little power and can be maintained for long periods of time with inexpensive batteries.

The real-time clock chip contains 14 bytes of clock and control registers. In addition, it contains 50 bytes of general purpose RAM. This general purpose RAM is used to store configuration information entered via the SETUP program (see Chapter 5). When battery backed up power is provided on the device, it maintains date, time, and configuration information after the computer system is turned off.

J22 is a battery connector that enables you to provide battery backed up power for the real time clock chip. The battery connector is a 1x4 header whose pin assignments are shown in Table 2-8.

Table 2-8 Battery Connector Pin-Out Spec.

Signal/Function	J22 Pin #
Battery (+)	1
Key (pin removed)	2
Ground (-)	3
Ground (-)	4

KEYLOCK INTERFACE

Connector J18 provides the interface that enables you to connect an electrical interlock, such as a key-activated switch, to lock out the keyboard. The keylock connector is a 1x5 header whose pin assignments are shown in Table 2-9.

An LED is connected between pin 1 and 3 to indicate system power ON/OFF. If pin 4 and pin 5 are connected by a keylock, the keyboard will not be recognized by system until these pins are disconnected.

Table 2-9 Keylock Connector Pin-Out Spec.

Signal/Function	J18 Pin #
Power for LED power-on light	1
Key (pin removed)	2
Ground	3
Keylock	4
Ground	5

SPEAKER INTERFACE

Connector J17 provides an interface that enables you to connect a speaker for audible tone generation. The connector is a 1x4 header whose pin assignments are shown in Table 2-10.

A speaker is connected between pin 1 and pin 4.

Table 2-10 Speaker Connector Pin-Out Spec.

Signal/Function	J17 Pin #
SPKOUT Speaker Drive Out	1
Key (pin removed)	2
Ground	3
+5V	4

POWER CONNECTORS

P1, the power connector, is a 12-pin connector that supplies power to the system board and to the eight expansion slots. Each pin has a 7 AMP. current-carrying capacity.

When using an AT-compatible power supply, pins 1 through 12 of power supply should match pins 1 through 12 on system board.

The estimated current requirements of the 80386 board is 5 AMPs.

KEYBOARD CONNECTOR

KB1, the keyboard connector, is a 5-pin DIN connector that provides an interface to IBM PC/AT compatible keyboards. The pin assignments are shown in Table 2-11.

Table 2-11 Keyboard Connector Pin-Out Spec.

Signal/Function	KB1 Pin #
KEYCLK (clock)	1
KEYDAT (data)	2
N/C	3
Ground	4
+5V	5
Cable shield (connector case)	6,7

HARDWARE RESET

Connector J19 provides a hardware reset with the same activity as the power up cold start.

Table 2-11 Hardware Reset Connector Pin-Out Spec.

Signal/Function	J19 Pin #
RESET	1
GROUND	2

CHAPTER 3

CONFIGURING THE 80386 BOARD

CHAPTER 3

CONFIGURING THE 80386 BOARD

The 386AT board has several jumper blocks that are used to set the configuration of the board. The following configuration options can be selected:

* Monitor type

* Math coprocessor

* Turbo LED and Turbo switch

This chapter describes the setting of various configuration options.

JUMPER LOCATIONS

Figure 2-1 shows the locations of all the jumper blocks on the 386AT board. The pin numbers shown in this figure are silk-screened on the board so that the pins can be easily located. This chapter refers to the individual pins by these numbers.

Setting board options involves placing the jumpers on the designated pins or removing a jumper for the designated pins. The following sections describe the configuration options that can be set. The default jumper settings are indicated with asterisks.

MONITOR TYPE

Jumper pins JP4 should be set depending on whether you will be using a color or monochrome monitor. The options are:

Display	Install Jumper
color(or EGA/VGA)	1-2
monochrome	2-3*

The factory setting is 2-3 for the monochrome monitor. If you are using a color monitor, change the jumper to 1-2.

MATH COPROCESSOR

Setting of jumper pins JP3 depends on whether you have a math coprocessor installed on the 386AT board or not. The math coprocessor can as well be an 80387/80287 chip module.

Option	Install Jumper
Math coprocessor installed	JP3-ON (SHORT)
Math coprocessor not installed	JP3-OFF* (OPEN)

The factory setting is JP3-OFF, indicating that the coprocessor is not installed. If you install a math coprocessor on the 80386 board, please put the jumper to JP3-ON position and refer to the following jumper table to set the JP1 and JP2 jumpers.

Math coprocessor\jumper	JP1	JP2(OPEN)	JP3
NO	OFF (OPEN)	OFF	OFF
80387	ON (SHORT)	OFF	ON
80287	OFF	OFF	ON

TURBO LED AND TURBO SWITCH

The speed of the system can be changed by either the software or the hardware switch.

1. CHANGED BY SOFTWARE

The BIOS allows the clock speed to be changed through the keyboard using the following key sequence:

```
+-------------------------------------------------+
|    <CTRL> <ALT> <+> - Change to high speed.     |
|    <CTRL> <ALT> <-> - Change to low speed.      |
+-------------------------------------------------+
```

2. CHANGED BY HARDWARE (J21)

```
+-------------------------------------------------+
|    20MHz(25MHz)------------------- 1,2 ON       |
|    16MHz(20MHz)------------------- 2,3 ON       |
+-------------------------------------------------+
```

TURBO LED (J20)

```
+-------------------------------------------------+
|    LED Active Signal-------------- 1            |
|    GROUND ------------------------ 2            |
+-------------------------------------------------+
```

The BIOS allows the wait state to be changed through the keyboard using the following key sequence:

```
+-------------------------------------------------+
| <CTRL> <L. SHIFT> <ALT> <+> To go to 0 wait state |
| <CTRL> <L. SHIFT> <ALT> <-> To go to 1 wait state |
+-------------------------------------------------+
```

CHAPTER 4

INSTALLATION

CHAPTER 4

INSTALLATION

This chapter describes the equipment you need to create a working system around the 80386 board. It also describes how to install 2MB memory board into the 32-bit expansion slot and how to install the math coprocessor.

BUILDING A SYSTEM

To build a system based on the 80386 board, you must obtain the following equipmentes:

* A chassis to hold all the system components. The 80386 board measures 12.0 inches by 13.8 inches (304.8 by 350.5 MM). It is the size to fit in an AT compatible chassis.

* A multi-voltage power supply similar to the one used in the IBM AT. Appendix A shows the pin-out of the power supply connectors. A 185 watt or more power supply is recommended. And a good "power good" signal is essential.

* A 6V battery to sustain the clock/calendar chip. Chapter 2 lists the pin assignment for the battery connector(J22).

* An 8 ohm speaker to provide sound capabilities for your system. The pin assignment for the speaker connector(J17) is listed in Chapter 2.

* A disk controller with cables connected to drives.

* At least one floppy disk drive (360KB or 1.2MB).

* A Hard disk drive if needed.

* A video controller and corresponding monitor.

* An AT-compatible keyboard.

* Additional memory, if necessary. The 80386 board Requires 2048K/8192K bytes of RAM.

To add extended memory above the 2M/8M bytes address range, insert 2M/8M memory boards into the 32-bit slot on the 80386 board. The next section in this chapter describes how to install this boards.

* If a math coprocessor is needed, the 80386 board provides a socket for 80387/80287 chip. A later section in this chapter describes how to install the math coprocessors.

* MS-DOS version 3.10 or later.

INSTALLING MEMORY BOARDS

The 80386 processor is capable of accessing memory 32 bits at a time. To enable 32-bit memory access, the 80386 board provides a full 32-bit data path for the 2048K/8192K bytes of on-board memory. In addition, it provides one expansion slot that also supply data 32 bits at a time to the processor. The slot J1/J9 is 32 bit expansion slot.

To take advantage of the 32-bit data path, you must install 2MB/8MB memory boards in these slots.

INSTALLING THE 80387 MATH COPROCESSOR

To install an 80387 math coprocessor, align the chip with socket U102 and make sure that pin 1 of the math coprocessor chip corresponds to pin 1 of the socket. Pin 1 of socket U102 is labeled and close to I.C. U102. Pin 1 of the 80387 is designated with a dot on the corner of the chip and with the corner of the chip cut off. Then press the 80387 into socket U102.

INSTALLING THE 80287 MATH COPROCESSOR

To install an 80287 math coprocessor, align the chip with socket U105 and make sure that pin 1 of the math coprocessor chip corresponds to pin 1 of the socket. Pin 1 of socket U105 is labeled and close to I.C. U105. Pin 1 of the 80287 is designated with a dot on the corner of the chip and with the corner of the chip cut off. Then press the 80287 into socket U105.

CHAPTER 5

SYSTEM SETUP

CHAPTER 5

SYSTEM SETUP

BIOS OVERVIEW

This guide explains how to :

a) Install the AMI-386 BIOS.
b) User the built-in Set-up Procedure.
c) Select the Clock Speed/Wait State through the Keyboard.
d) Interpret the errors reported by the AMI-BIOS.
e) Use the 3 1/2" floppy drive support effectively.

INSTALLING THE AMI-386 BIOS

Skip this paragraph if the BIOS is already plugged on the Mother board.

Before you begin the installation ensure the following:

i) The Board is powered down.
ii) ROM's are susceptible to static electricity. So observe the following precautions when you handle a ROM:
   a) Unpack the ROM's on a ground connected anti-static mat.
   b) Wear an anti-static wristband, grounded at the same point as the anti-static mat.
      (A cheaper solution is to use a sheet of conductive aluminum foil grounded through a 1 Mega-ohm resistor instead of an anti-static mat. Similarly, a strip of conductive aluminum foil wrapped around the wrist and grounded through a 1 Mega-ohm resistor will serve the purpose of a wrist band.)

Ensure that the ODD and EVEN BIOS go into their respective sockets.

STARTING UP THE SYSTEM

Power up the system and wait for the BIOS to show up the BIOS activity on the screen.

MEMORY TEST BYPASS

The BIOS performs diagnostics of the system and displays the size of the memory being tested.

Note that you can bypass the memory test by pressing the <ESC> key. This option would be quite useful when the memory on the system is quite large. You should hit the <ESC> key when the message Press <ESC> key to bypass MEMORY test appears on the screen.

CMOS SETUP

Immediately after the memory and cache test, you will get the following prompt on the screen:

Press <DEL> key to run SETUP utility

Hit <DEL> key to get into the setup mode. Note that <DEL> key will get you into the setup mode only when the message :

Press <DEL> key to run SETUP utility

is displayed on the screen.

If you hit <DEL> key the following message appears on the screen:

WANT TO RUN SETUP UTILITY (Y/N)?

If you hit <Y> or <y> and the <ENTER> key you have the setup screen.

TIME/DATE SETUP

The setup screen looks like below:

```
+-------------------------------+
|        C M O S    S E T U P   |
| Current date is: XX-XX-XXXX   |
| Enter new date (MM-DD-YYYY)?  |
+-------------------------------+
```

To this question you would have to enter the date in the format shown on the screen.

If you feel that the current date should remain unchanged, you would just have to hit the <ENTER> key. In such a case the new date is set to the same value as the current date.

The next question you have on the screen is:

```
+-------------------------------+
| Current time is:XX:XX:XX      |
| Enter new time (HH:MM:SS)?    |
+-------------------------------+
```

To this question you key in the time in the format defined. Press <ENTER> key alone if the current time is right.

As soon as you have done this the BIOS shows you the type of the display on your system.

After that, the setup takes two different paths depending upon the CMOS being initialized or uninitialized.

CMOS INITIALIZED

Under these conditions you would see the following messages:

```
+-------------------------------------------------------------------+
| Fixed disk drive C type  : X (if installed else Not Installed.)   |
| Fixed disk drive D type  : X (if installed else Not Installed.)   |
| Diskette drive A is      : High Capacity (if 360KB then Double Sided,
|                            if not present not installed).         |
| Diskette drive B is      : Double Sided (Other options as above)  |
| Base Memory Size is      : XXX KB                                 |
| Expansion memory size is : XXXX KB                                |
|                                                                   |
| Are these options correct (Y/N) ?                                 |
|                                                                   |
+-------------------------------------------------------------------+
```

Note that the information about Drive A indicates 3 1/2", as CMOS had been set earlier to reflect this status. If on the contrary, CMOS had been set for a 1.2MB drive, the message in place of 3-1/2" it would be High Capacity.

If you feel that the information displayed above is right, hit <Y> and the <ENTER> key to proceed to system boot with the new information.

CMOS UNINITIALIZED

DISK DRIVE TYPE DEFINITION

In this case you would have the enter the type of the fixed Drive C in response to the message :

```
+-------------------------------------------+
|      .... WARNING ....                    |
| Entering the wrong disk drive TYPE        |
| causes improper operation of the disk     |
| If disk not installed press <RETURN>      |
| For disk TYPE details press <ESC>         |
|                                           |
| Enter disk drive C type (1-46) ?          |
+-------------------------------------------+
```

Note that the disk type details are only a key stroke away. Hit <ESC> to find for yourself. You could always come back by hitting <ESC> again.

Once you have convinced about the drive type enter the appropriate number and hit <ENTER>.

Note that pressing <ENTER> key alone indicates the absence of the Drive C.

You would then be asked to enter the type of the disk Drive D. The procedure for doing this is the same as that for drive C.

Remember if you do not have disk Drive D on your system, you just have to hit the <ENTER> key.

FLOPPY DRIVE TYPE DEFINITION

Is diskette drive A 3 1/2" (Y/N)?

The above question is asked if the drive has been found to have 80 tracks. Since a drive with 80 tracks could either be a

- high capacity i.e 1.2 MB drive
- or 3 1/2" i.e 720 KB drive,

you would have to answer this question.

By entering <N> of <n> you can select the high capacity drive. Alternatively enter <Y> or <y> to select a 720 KB drive. This question could come upfor the case of drive B as will provided it has been detected as a 80 track drive by the BIOS.

If you hit the <ENTER> key alone, the BIOS assumes the drive to be a 1.2MB drive.

At this point you have entered all the information the BIOS requires for starting up the system.

BIOS detects a few details by itself, e.g. the diskette drive type in case of a 360 KB drive as shown below:

```
+-------------------------------------------------------------------+
| Diskette drive B is       :Double Sided (Other options as above)  |
| Base Memory Size is       :XXX KB                                 |
| Expansion memory size is :XXXX KB                                 |
|                                                                   |
| Are these options correct (Y/N) ?                                 |
+-------------------------------------------------------------------+
```

If you are convinced at this stage that all the information you have entered up to this point is right, hit <Y> or <y> key followed by <ENTER> key. When you do this the BIOS goes all over again to boot up the system with the information specified.

However, if you would like to modify some information then you hit either <N> or <n> key followedby <ENTER>. You would now go through setup all over again.

SUMMARIZE OF SET-UP

The Set-Up screen thus requires you to set

a) Date
b) Time
c) Hard Disk Type For Drive C (if present).
d) Hard Disk Type For Drive C (if present).

The Set-up procedure also automatically detects the following:

a) Type of Display Card.
b) Size of Real Memory.
c) Size of Memory beyond 1MB.
d) Presence of floppy drives and their types.
e) Presence of a 80287.

Also, if a second Hard Disk drive is physically connected but the CMOS is not set for this Drive D, the BIOS informs you about the same and gives you a chance to configure the drive through setup.

Having Set-Up the CMOS, the BIOS runs through the diagnostics again, tests the memory, sets up the devices configured and proceeds to boot.

Note that the Set-Up option is available even after a soft reset.

WHEN TO RUN SETUP?

The BIOS prompts you run Set-Up under the following conditions:

a) CMOS options not set.
b) Display Configuration Mismatch.
c) Memory Size Mismatch.
d) Hard Disk Set-Up error.
e) CMOS battery is low.
f) An additional hard disk presence is detected.

SELECTING CLOCK SPEED/WAIT STATUS

AMI-BIOS allows you to change Clock Speeds and Wait States through the keyboard at any time. Following are the key combinations and their meanings:

Key Combinations	Meaning
1.<CTRL><ALT><+>	Switch to high speed.
2.<CTRL><ALT><->	Switch to low speed.
3.<CTRL><L.SHIFT><ALT><+>	Switch to zero wait state.
4.<CTRL><L.SHIFT><ALT><->	Switch to one wait state.

ERRORS REPORTED BY AMI-BIOS

AMI-BIOS performs various diagnostics tests at the time the system is powered up. Whenever an error is encountered during these tests either you hear a few short beeps or see a error display on your monitor.

If the error comes before the display device is initialized, system reports the error by giving (X) short beeps, otherwise error message will be be displayed on the screen.

If the error is FATAL then system HALTS after reporting the FATAL error. If the error is NON-FATAL then process continues after reporting the NON-FATAL error.

The following errors are reported by giving (X) short beeps; so that by counting the no. of short beeps, you can identify the error.

NO. OF BEEPS	MEANING OF ERROR
1	DRAM refresh failure.
2	Parity Circuit failure.
3	Base 64KB RAM failure.
4	System Timer failure.
5	Processor Failure.
6	Keyboard Controller - Gate A20 error.
7	Virtual Mode Exception Error.
8	Display Memory R/W Test Failure.(*)
9	ROM-BIOS CheckSum Failure.

(*) Non-Fatal Error

ERROR MESSAGES

FATAL ERRORS

1. Channel -2 of Timer Not Functional
2. Stray Interrupt sensed in controller
3. Interrupt controller #2 not functional

NON-FATAL ERRORS

1. Keyboard Error.
2. Keyboard/ Interface Error.
3. CMOS battery state low.
4. CMOS system options not set.
5. CMOS checksum failure.
6. CMOS memory size mismatch.
7. CMOS system time and date not set.
8. CMOS display configuration mismatch.
9. Display setting not proper.
10. Keyboard is locked ..... Unlock it.
11. Floppy disk controller failure.
12. Hard disk unit 0 error.
13. Hard disk unit 1 failure.
14. Hard disk unit 0 failure.
15. Hard disk unit 1 failure.
16. Hard disk unit 1 is not defined in CMOS.
17. Cache Memory Board - Do Not Enable Cache.

Please refer to this list whenever you have any difficulties with the system. Should you still have problems call AMI Customer Support for further help.

USE OF 3 1/2" SUPPORT EFFECTIVELY

DOS 3.20 provides support for 3 1/2" drives. For this purpose it needs support from the ROM BIOS. AMI-BIOS release date 12/03/86 onwards provides the necessary support.

The 3 1/2" drive can be freely configured as Drive A or Drive B with this BIOS. Thus it is possible to boot off directly from a 3 1/2" drive.

Earlier versions of DOS would require the use of DRIVER.SYS to provide the necessary support.

A few points would have to be kept in mind when you use the 3 1/2" driver and a 1.2 MB together. Ensure that when you perform the Setup you define the drives

correctly. Incorrect definition could make the drive unusable.

The table below describes the valid combinations on a AT:

CMOS Status	Physical Drive Status	Functional
1.2 MB	1.2 MB	YES
3 1/2"	3 1/2"	YES
Undefined	1.2 MB	YES

The remaining combinations are invalid. Please make a note of these combinations before you call us for help.

APPENDIX A

HARD DISK INTERLEAVE

APPENDIX A

HARD DISK INTERLEAVE

Interleave Factor - What is it ?

To understand the meaning of Interleave associated with Hard Disks, we shall take you through an analogy. We hope we have mode the meaning clear when we finish the analogy.

Consider the game of a roulette where a round table is set in motion and people wait for the motion to stop on their lucky number.

We shall add a slight twist to this game.

Assume we have 17 sectors on the roulette round table and that we have 17 coins numbered and stacked up in the order 1 through 17 with coin 1 at the top.

We shall now wet the round table in motion at a reasonable speed and give ourselves the task of placing the coin from the stack pile on every sector taking the minimum time and remaining static at one place during the course of the game.

Assume you have placed coin 1 in a certain sector. By the time you pick up the next coin and place it, the immediate sector following coin 1 would have passed you. So what you would then do, is to place eit on the sector just passing by.

Thus after placing the coins in all the sectors, you should stop the roulette table and look at coins number in the contiguous sectors.

Ycu are sure to find that they are not in an increasing order. You soon realize that this disorder is due to the fact that the game requires you to place all the coins in minimum time.

If you had wanted the coins in an order, you would have had to wait for at least 17 revolutions before placing all the coins.

The average number of contiguous sectors between a sector occupied by coin 'n' and by coin 'n+1' can be termed as Interleave factor.

In this analogy the Hard Disk is the roulette table in motion at a constant speed of 3600 rpm and the person can be visualized as the head and the related data transfer hardware.

Information is organized in sectors and the sectors are accessed by their numbers. Thus using a specific interleave to number the sectors helps in achieving a data transfer rate change.

For a Hard disk with factory specified access times, the only factor in the control of the user is the Interleave factor.

We realize this and we have the Auto Interleave feature which does exactly this. Thus it is important that the value chosen gives the best performance.

APPENDIX B

HARD DISK TYPE DETAILS

Disk Type Details					
Type	Cylinders	Heads	Write-precomp	Landing-zone	Capacity
1	306	4	128	305	10 MB
2	615	4	300	615	21 MB
3	615	6	300	615	31 MB
4	940	8	512	940	64 MB
5	940	6	512	940	48 MB
6	615	4	NONE	615	21 MB
7	462	8	256	511	31 MB
8	733	5	NONE	733	31 MB
9	900	15	NONE	901	115 MB
10	820	3	NONE	820	21 MB
11	855	5	NONE	855	36 MB
12	855	7	NONE	855	51 MB
13	306	8	128	319	21 MB
14	733	7	NONE	733	44 MB
15	000	0	000	000	00 MB
16	612	4	ALL CYLS.	663	21 MB
17	977	5	300	977	42 MB
18	977	7	NONE	977	58 MB
19	1024	7	512	1023	61 MB
20	733	5	300	732	31 MB
21	733	7	300	732	42 MB
22	733	5	300	733	31 MB
23	306	4	ALL CYLS.	336	10 MB
24	925	7	ALL CYLS.	925	56 MB
25	925	9	NONE	925	72 MB
26	754	7	754	754	46 MB
27	754	11	NONE	754	72 MB
28	699	7	256	699	42 MB
29	823	10	NONE	823	71 MB
30	918	7	918	918	55 MB
31	1024	11	NONE	1024	98 MB
32	1024	15	NONE	1024	133 MB
33	1024	5	1024	1024	44 MB
34	612	2	128	612	10 MB
35	1024	9	NONE	1024	80 MB
36	1024	8	512	1024	71 MB
37	615	8	128	615	42 MB
38	987	3	987	987	25 MB
39	987	7	987	987	60 MB
40	820	6	820	820	42 MB
41	977	5	977	977	42 MB
42	981	5	981	981	42 MB
43	830	7	512	830	50 MB
44	830	10	NONE	830	72 MB
45	917	15	NONE	918	115 MB
46	000	00	000	000	00 MB

APPENDIX C

BIOS DIAGNOSTICS DETAILS

APPENDIX C

AMI ROM-BIOS DIAGNOSTICS DETAILS

Power on diagnostic routine tests various IC's, I/O devices etc. Whenever an error is encountered, system diagnostics reports the error either on the display screen or by giving (X) short beeps.

If the error comes before the display device is initialized, system reports the error by giving (X) short beeps, otherwise error message will be displayed on the screen. If the error is FATAL then system HALTS after reporting the FATAL error. If the error is NON-FATAL then process continues after reporting the NON-FATAL error.

The following errors are reported by giving (X) short beeps, so that by counting the no. of short beeps, you can identify the error.

NO. OF BEEPS	MEANING OF ERROR
1	DRAM refresh is not working.
2	Parity circuit is not working or parity status bits are not cleared when parity is disabled.
3	First 64K memory test failure. Address line test (A0...A15) failure.
4	System timer is not counting properly.
5	Processor register/flag test failure.
6	8042 Keyboard controller gate-A20 error.
7	Virtual mode exception error encountered.
8	Display memory R/W test failure (NON-FATAL).
9	ROM-BIOS checksum error.

Following are the possible checkpoints in order during diagnostics.

01) Processor flag test failure. (FATAL)
02) Processor register test failure. (FATAL)
03) ROM-BIOS checksum failure. (FATAL)
04) Channel-2 time failure. (NON-FATAL)
(counter register R/W test with gate disabled)
05) Channel-2 timer not counting properly. (NON-FATAL)
(DELTA count test with gate enabled)
06) Channel-1 timer not counting properly. (FATAL)
(used for DRAM refresh)
07) Channel-0 timer not counting properly. (FATAL)
(used for system timer)
08) Parity status bits are not cleared when (FATAL)
parity is disabled.
09) DRAM refresh is not working. (FATAL)
10) Address test on first 64K failure (FATAL)
(A0...A15)(first display address LOW byte,
next high byte).
11) Sequential data pattern test on first (FATAL)
64K failure. (first display failed address,
next XOR'd data pattern)
12) Random data test on random address on (FATAL)
first 64K failure. (same as previous test)
13) Parity error found during memory test. (FATAL)
14) Keyboard controller not responding. (FATAL)
15) Keyboard controller self test failure. (FATAL)
16) Keyboard controller mode has not got set (FATAL)
properly.
17) SYSTEM-BIT on keyboard controller status (FATAL)
byte is not set.
18) CMOS register R/W test failure. (FATAL)
19) Optional video-ROM present but (NON-FATAL)
checksum filed.
20) Optional video-ROM not returning control. (FATAL)
21) Display memory R/W test failure. (NON-FATAL)
22) CGA/MONO display card cursor reg. (NON-FATAL)
R/W test failure.
23) Checkpoint for entering in virtual mode. (FATAL)
24) Gate-A20 enable failure. (NON-FATAL)
25) Address test on DRAM failure (NON-FATAL)
(A16...A23)(first display failed address,
next XOR'd data pattern)

26) Sequential data pattern test on DRAM failure. (first display failed address, next XOR'D data pattern) (NON-FATAL)

27) Random data test on random address on DRAM failure. (same as previous test) (NON-FATAL)

28) Parity error found during memory test. (NON-FATAL)

29) Checkpoint for shutdown (back to real mode). (NON-FATAL)

30) Gate-A20 disable failure. (NON-FATAL)

31) DMA controller page register R/W test failure. (display XOR'D data pattern) (FATAL)

32) DMA controller register F/F latch test failure. (FATAL)

33) DMA controller#1 test failure. (FATAL)

34) DMA controller#2 test failure. (FATAL)

35) Interrupt controller #1 mask reg. R/W test failure. (FATAL)

36) Interrupt controller #2 mask reg. R/W test failure. (NON-FATAL)

37) Spurious interrupts sensed on interrupt controller #1 (FATAL)

38) Keyboard BAT failure. (NON-FATAL)

39) Keyboard test failure. (Keyboard or interface error) (NON-FATAL)

40) Keyboard data line stuck at LOW/HIGH. (display the data line status) (NON-FATAL)

41) Keyboard clock line stuck at LOW/HIGH. (display the clock line status) (NON-FATAL)

42) Stuck key found from keyboard. (NON-FATAL)

43) Checkpoint for printer setup. (NON-FATAL)

44) Checkpoint for RS-232 setup. (NON-FATAL)

45) Checkpoint for time and date setup. (NON-FATAL)

46) Checkpoint diskette setup. (NON-FATAL)

47) Checkpoint for hard disk setup. (NON-FATAL)

48) Optional ROM present but checksum failed. (C800) (NON-FATAL)

49) Optional ROM not returning control. (C800...E000) (FATAL)

50) Optional ROM present but checksum failed. (E000) (NON-FATAL)

51) Optional Rom not returning control. (E000) (FATAL)

52) Checkpoint for BOOT LOADER (NON-FATAL)

APPENDIX D

SPECIFICATIONS

APPENDIX D

SPECIFICATIONS

1) CPU : 80386 32-bit microprocessor

2) Work Size

* Data Path : 8-, 16-, 32-bit
* Physical Addressing : 20 address lines in Real mode
  32 address lines in Protected mode.
* Virtual Addressing : two to the 46 power bytes in PVAM.

3) Clock Rates

* Processor clock : 16MHz/20MHz(20MHz/25MHz)

4) Memory

* Eprom : UP TO 256 KBx2
* RAM on board : 2048KB/8192KB
* Extended RAM : 0 to 15 MB on memory and expansion boards

5) Dimensions

* Length and width : 12.0 by 13.8 inches (304.8 by 350.5 mm)
* Height (max. with mounted components) : 0.5 inches (1.7 mm) without expansion boards and cables
* PCB Thickness : 0.0625 inches nominal
* Weight : 18 ounces (510 grams)

6) Environment : Operating Temperature $10^{o}C$ to $40^{o}C$, $50^{o}F$ to $104^{o}F$

Required
* Airflow : 50 linear feet per minute across 80386
* Storage Temperature : $-40^{o}C$ to $70^{o}C$, $104^{o}F$ to $158^{o}F$
* Humidity : 0 to 90%, *noncondensing

* Altitude : 0 to 10,000 feet

APPENDIX E

SERVICE INFORMATIONS

APPENDIX E

SERVICE INFORMATIONS

Turn-Point System Inc.will only deal with those who purchased directly from us. If you have a problem and you are not our agent call the dealer or agent you purchased the product.

Customer Support Service provides both a Return Replacement Authorization (RRA) and Return Material Authorization.(RMA) service.

The RRA service replaces a defective product: return the defective product to Turn-Point, freight prepaid, and Turn-Point replace the product. This service is offered on the product is not functioning right after receiving.

The RMA service provides repair work: return the defective product to Turn-Point, freight prepaid. We will repair, test, and update it according to Engineering Change Orders for the product. Normal turnaround time is one to two weeks from receipt of the defective product.

Before calling Customer Support Service, have this information ready:

* Part and serial number of the product.
* Purchase order number, for repair and shipping charges.
* If it is a warranty repair, the proof of purchase showing the product was received within 90 days of the service request date. Without proof, services will be billed at the current rate.
* Your shipping and billing addresses.
* Your telephone number and contact person.

SHIPPING TO CUSTOMER SERVICE

When corresponding with Customer Support Service, refer to the authorization number on the packing slip, the purchase order, and any other related documents.

Because the repaired or replacement board will be in the default configuration, return your board in its original state:

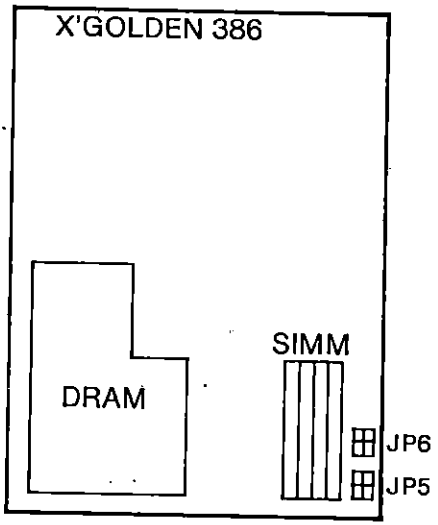
1. Put the jumpers in the default positions.
2. Remove all optional equipment, such as expansion cards and the math coprocessor.
3. Disconnect the battery from the real-time clock.
4. Write a note to describe the problem as detail as possible.

Protect the equipment from damage in transit:

1. Place boards in antistatic bags and then in padded shipping bags.
2. Protect the product with protective padding such as flow pack or foam.
3. Write the return authorization number on the outside of the box and label it "FRAGILE."

NOTE :Damage due to lack of compliance with safe return packaging could result in extra repair charges.

NOTE:



JUMPER \ RAM	DRAM	SIMM
JP6 [][] JP5 [][]	BANK ϕ	BANK1
JP6 [] JP5 []	BANK1	BANK ϕ